

**WHAT IS CLAIMED IS:**

1 1. A system for feeding comminuted cellulosic fibrous material in a liquid slurry to at  
2 least one digester, comprising:  
3 a device which slurries comminuted cellulosic fibrous material in liquid;  
4 a first pump for pumping slurry from said slurrying device to at least one digester;  
5 a second pump for supplying make-up liquid to the digester;  
6 a source of liquid for slurrying the comminuted cellulosic fibrous material; and  
7 a single tank which performs both the function of controlling the level of liquid in said  
8 slurrying device, and the function of storing and supplying liquid in association with said  
9 source to said second pump, so that said first pump is properly and effectively substantially  
10 continuously supplied with liquid slurry, and said second pump with liquid.

1 2. A system as recited in claim 1 wherein said slurrying device includes a  
2 substantially vertical conduit, and wherein said single tank substantially surrounds said  
3 conduit and is in liquid communication therewith.

1 3. A system as recited in claim 2 wherein said first pump is operatively connected  
2 to said substantially vertical conduit by a connecting conduit or transition; and wherein  
3 there is a gap between said substantially vertical conduit and said connecting conduit or  
4 transition; and wherein said single tank substantially surrounds said gap.

1 4. A system as recited in claim 3 wherein said gap has a substantially vertical  
2 dimension of between about 3-48 inches, and wherein a screen or strainer is provided at  
3 said gap to minimize the amount of comminuted cellulosic fibrous material passing into  
4 said single tank through said gap.

1 5. A system as recited in claim 4 wherein said substantially vertical conduit is in  
2 further liquid communication with said single tank by at least one opening in said conduit  
3 vertically above and spaced from said gap.

6. A system as recited in claim 2 wherein said single tank is substantially concentric with said substantially vertical conduit.

7. A system as recited in claim 2 wherein said single tank comprises a substantially right cylindrical upper portion and a substantially right circular cone frustum lower portion.

8. A system as recited in claim 2 wherein said single tank has a substantially right cylinder shape.

9. A system as recited in claim 1 wherein said single tank is spaced and distinct from said slurring device.

10. A system as recited in claim 1 further comprising a high pressure feeder connected to said first pump and having a low pressure outlet; an undesirable solids separator connected to said low pressure outlet; an in-line drainer connected to said separator; said in-line drainer having a first outlet line connected to said second pump, and a second outlet line connected to said slurring device; and an automatically controlled flow-controlling valve in said second outlet line which controls the proportion of liquid from said in-line drainer flowing in said first outlet line compared to said second outlet line.

11. A system as recited in claim 2 further comprising a high pressure feeder connected to said first pump and having a low pressure outlet; an undesirable solids separator connected to said low pressure outlet; an in-line drainer connected to said separator; said in-line drainer having a first outlet line connected to said second pump, and a second outlet line connected to said slurring device; and an automatically controlled flow-controlling valve in said second outlet line which controls the proportion of liquid from said in-line drainer flowing in said first outlet line compared to said second outlet line.

12. A system as recited in claim 11 wherein said second outlet line, downstream of said valve, is substantially directly connected to both said substantially vertical conduit above said single tank and to said single tank.

1 ~~360~~ 13. A comminuted cellulosic fibrous material treatment system, comprising: a  
2 digester having a comminuted cellulose material inlet at the top thereof;  
3 a first vessel, at a first pressure, containing comminuted cellulosic fibrous material,  
4 and having a top, a bottom, and an outlet adjacent said bottom;  
5 a conduit having an inlet communicating with the outlet of said first vessel, and an  
6 outlet;  
7 a second vessel, having a width dimension greater than said conduit, for receiving  
8 the cellulosic material from said conduit and having a level of liquid therein; and  
9 a slurry pump having an inlet for receiving material from the second vessel and an  
10 outlet operatively connected to the inlet of said digester.

14. A system as recited in claim 13 further comprising a metering device between  
and connecting said first vessel and said conduit inlet.

15. A system as recited in claim 13 further comprising a pressure-isolation device  
between and connecting said first vessel and said conduit inlet.

16. A system as recited in claim 13 wherein said first vessel comprises a device  
which steams comminuted cellulosic fibrous material.

17. A system as recited in claim 13 wherein said second vessel comprises a tank  
2 having a substantially right cylinder upper portion; and a substantially right circular cone  
3 frustum lower portion, said tank and said conduit being substantially concentric and in  
4 liquid communication with each other.

1 ~~362~~ 18. A system as recited in claim 17 wherein said slurry pump is operatively  
2 connected to said conduit by a connecting conduit or transition; and wherein there is a gap  
3 between said conduit and said connecting conduit or transition; and wherein said tank  
4 substantially surrounds said gap.

19. A system as recited in claim 18 wherein said gap has a substantially vertical  
2 dimension of between about 3-48 inches, and wherein a screen or strainer is provided at

said gap to minimize the amount of comminuted cellulosic fibrous material passing into said single tank through said gap.

20. A system as recited in claim 19 wherein said substantially vertical conduit is in further liquid communication with said single tank by at least one opening in said conduit vertically above and spaced from said gap.

~~183~~ 21. A system as recited in claim 13 wherein said second vessel comprises a tank, and wherein said slurry pump is operatively connected to said conduit by a connecting conduit or transition; and wherein there is a gap between said conduit and said connecting conduit or transition; and wherein said tank substantially surrounds said gap.

22. A system as recited in claim 21 wherein said gap is between about 1-2 feet and substantially open and provides substantially free communication between said tank and said conduit.

~~184~~ 23. A system as recited in claim 13 wherein said second vessel comprises a tank in liquid communication with and substantially surrounding said conduit, said conduit having a screen surface substantially where surrounded by said tank.

24. A method of feeding a slurry of comminuted cellulosic fibrous material in liquid to a digester having an inlet utilizing a pretreatment vessel, and a slurry pump having an inlet, comprising:

- (a) pretreating the comminuted cellulosic fibrous material in the pretreatment vessel;
- (b) passing the pretreated material from the pretreatment vessel into a first conduit;
- (c) discharging the material from the first conduit into a tank having a width dimension greater than the first conduit;
- (d) entraining the comminuted cellulosic fibrous material in liquid in the tank to form a slurry;
- (e) feeding the slurry to the inlet of the slurry pump; and
- (f) transporting the slurry to the inlet of the digester.

25. A method as recited in claim 24 utilizing a high-pressure transfer device having a low-pressure inlet and outlet and a high pressure inlet and outlet, said method further comprising, between (e) and (f), (g) pumping the slurry with the slurry pump to the low-pressure inlet of the high-pressure feeder, and (h) discharging the slurry from the high-pressure outlet of the high-pressure feeder.

26. A method as recited in claim 24 further comprising between (c) and (d), (l) metering the flow of comminuted cellulosic fibrous material from the pretreatment vessel.

27. A method as recited in claim 25 further comprising passing the liquid from the low pressure outlet through an in-line drainer, and returning slurry from the in-line drainer to the first conduit.

28. A method as recited in claim 27 further comprising pressurizing the liquid from the in-line drainer in a pressurizing device, and passing liquid from the pressurized liquid to the digester.

29. A method as recited in claim 28 further comprising passing some liquid directly from the tank to just prior to the pressurizing device.

30. A method as recited in claim 28 further comprising passing some of the pressurized liquid from the pressurizing device to the high pressure inlet to or outlet from the high pressure feeder.

31. A system for feeding comminuted cellulosic material entrained in liquid to a high pressure feeder connected to a digester, comprising:  
a vertical treatment vessel having a discharge at the bottom thereof;  
a metering device connected to the discharge of said treatment vessel;  
a generally vertical chute extending downwardly from said metering device; a high pressure feeder connected to a digester;  
a slurry pump which pumps a slurry of comminuted cellulosic material in liquid, said slurry pump having an inlet, said pump connected to said high pressure feeder; and

a vessel having a width dimension greater than the width dimension of said chute, positioned concentric with said chute, and having a liquor level therein and an outlet operatively connected to said slurry pump inlet.

32. A slurry transport with liquid level control, comprising:

a substantially vertical conduit;

a tank, having a top and a bottom, surrounding a portion of said conduit and in liquid communication therewith so that the liquid level in said tank controls the liquid level in said conduit; and

said liquid communications being provided at least in part by a bottom end of said conduit terminating above said bottom of said tank to provide a vertical gap.

33. A slurry transport as recited in claim 32 further comprising a screen or strainer at said vertical gap to minimize the amount of slurried material passing from said conduit to said tank, and wherein said gap is about 3-48 inches.

34. A slurry transport as recited in claim 33 wherein said single tank is substantially concentric with said substantially vertical conduit; and wherein said single tank comprises a substantially right cylindrical upper portion and a substantially right circular one frustum lower portion.

35. A method of feeding comminuted cellulosic fibrous material to a digester using a high pressure transfer device having a high pressure inlet and outlet, and low pressure inlet and outlet, comprising:

a) slurrying the material with liquid prior to feeding the slurry into the low pressure inlet;

b) returning liquid and any entrained material from the low pressure outlet to the low pressure inlet in a return system devoid of an in-line drainer and level tank;

c) pressurizing the slurry in the high pressure transfer device by pumping high pressure liquid into the high pressure inlet of the transfer device; and

d) passing the liquid from the high pressure outlet of the transfer device to the digester.

1 36. A method as recited in claim 35 wherein b) is further practiced using a return  
2 system also devoid of a centrifugal separator.

1 37. A method as recited in claim 36 wherein b) is further practiced using a return  
2 system also devoid of a surge tank.

1 38. A method as recited in claim 36 further comprising removing tramp material  
2 from liquid circulating to or from the high pressure transfer device using a tramp material  
3 trap.

1 39. A method as recited in claim 35 wherein a)-d) are practiced without a screen in  
2 the low pressure outlet.

1 40. A feed system for a digester, comprising:  
2 a high pressure transfer device having a high pressure inlet and outlet, and low  
3 pressure inlet and outlet;  
4 a slurring device connected to the low pressure inlet which slurries comminuted  
5 cellulosic fibrous material with liquid;  
6 a high pressure pump for pressurizing liquid being fed to the high pressure inlet;  
7 a connection between the high pressure outlet and a digester;  
8 a return system for returning liquid from the low pressure outlet to the slurring  
9 device; and  
10 said return system devoid of an in-line drainer and level tank.

1 41. A system as recited in claim 40 further comprising a pump not adversely  
2 affected by the presence of comminuted fibrous material in fluid pumped thereby, said  
3 pump connected between said return system and a digester.

1 42. A system as recited in claim 41 wherein said pump comprises a screw pump.

48. A system as recited in claim 47 wherein said slurrying device comprises a substantially vertical conduit substantially surrounded by a single tank which performs both the function of controlling the level of liquid and storing and substantially continuously supplying liquid to said pump.